

United States Department of Agriculture
Bureau of Entomology and Plant Quarantine

A SIMPLE SOIL WASHER FOR LARGE SAMPLES

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The apparatus described herein was devised for use in separating larvae, pupae, and unemerged adults of flea beetles from the soil of tobacco and potato fields in which they develop. The description of a similar soil washer by W. R. S. Ladell 1/ was followed, with certain modifications. The soil washer is thought to be simple, convenient, and easily assembled and operated. It has recovered, under test, 23 out of 25 small insects of various stages, excluding eggs, put into soil to be washed through it. It is capable of handling samples of considerable mass and weight, although it is not believed to be so well adapted to the recovery of insect eggs as the apparatus previously described by F. H. Shirck. 2/

The soil washer consists of four cans, a stirring device revolved by a 1/4-horsepower motor, and a series of three screens. The largest can (fig. 1) is an oil drum cut in half, measuring 24 inches in diameter and 25 inches in depth. A 1/2-inch copper tube containing a ball bearing is soldered to the center of the bottom, and a small copper tube, for releasing compressed air at the bottom of the tank, is soldered down the inner surface of one side (fig. 2). Across the top of the can is laid a strip of 1½-inch strap iron, fastened in place with stove bolts and bored through at the center to take a 1/2-inch rod.

The stirring device (fig. 2) consists of a shaft, 1/2 inch in diameter and 28½ inches long, to which are bolted two cross bars of 1½-inch strap iron holding two blades. These are arranged similarly to those in an old-fashioned ice-cream churn. The

1/ Ladell, W. R. S. A New Apparatus for Separating Insects and other Arthropods from the Soil. *Ann. App. Biol.* 23 (4): 862-879, illus. 1936.

2/ Shirck, F. H. Soil-Washing Apparatus and Methods Used in Counting Wireworm Eggs. ET-71, January 1936, illus. Shirck, F. H. A Soil-Washing Device for Use in Wireworm Investigations *Jour. Econ. Ent.* 23: 991-994, illus. 1930.

blades are of $3\frac{1}{2}$ -inch strap iron $18\frac{1}{4}$ inches long and are given a quarter twist when attached. To the top of the shaft is fixed an old-style sewing machine treadle wheel, $13\frac{3}{4}$ inches in diameter (fig. 2).

A 1/4-horsepower electric motor is fastened to a 4 by 4 inch wooden upright and is geared down by two pulleys, one 8 inches in diameter and one 2 inches.

The total cost of the apparatus, including a second-hand motor, is about \$10.

Openings cut near the top of the largest can allow the surface water to drain to the next smaller can through a 1/4-inch mesh hardware-cloth screen. The water and debris passing this screen are allowed to churn in the second can, which also has a compressed-air tube but lacks the stirring mechanism.

From this can the surface water and debris flow to the next smaller can through a 1/8-inch-mesh hardware-cloth screen. The material passing this screen is allowed to flow over a white cheesecloth on a rack of 18-mesh window screening, is further washed with clear water, and then examined.

A 12-percent solution of Epsom or table salt may be used to help float the insects out. The solution can be allowed to settle and be re-used. In some cases good results may be obtained without either the salt or the compressed air. The apparatus will handle as much as six 2-gallon buckets of earth at one time. About 20 minutes are required to wash a sample and change the water.

The items and materials used in making the soil washer are as follows:

1/2 oil drum	22 $\frac{1}{2}$ in. dia. and 28 in. deep
2 ash cans	16 in. dia.
1 preserving kettle	13 in. dia.
2 blades, iron stock	18 in. long and $3\frac{1}{2}$ in. wide
4 crossbars, iron stock	1 $\frac{1}{2}$ in. by 15 in.
1 rod	1/2 in. dia. and 29 in. long
1 strap	1 $\frac{1}{2}$ in. by 1/4 in. by 24 in. (turn down each end, 28 in. overall)
copper tubing	6 feet, 1/4 in. dia.
copper tubing	1 in. dia. and 2 in. long
1 ball bearing	1/2 in. dia.
1 pulley wheel	8 in. dia.
1 pulley wheel	2 in. dia.
1 pulley jack	
1 pulley belt	25 in. long (54 in. overall)
1 pulley belt	18 in. long (40 in. overall)
12 nuts and bolts	1/4 by 1 $\frac{1}{2}$ in.
1 sewing machine treadle wheel	

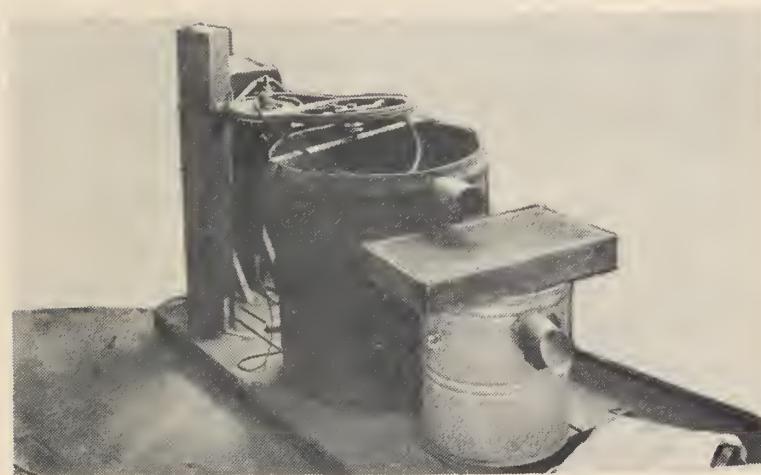
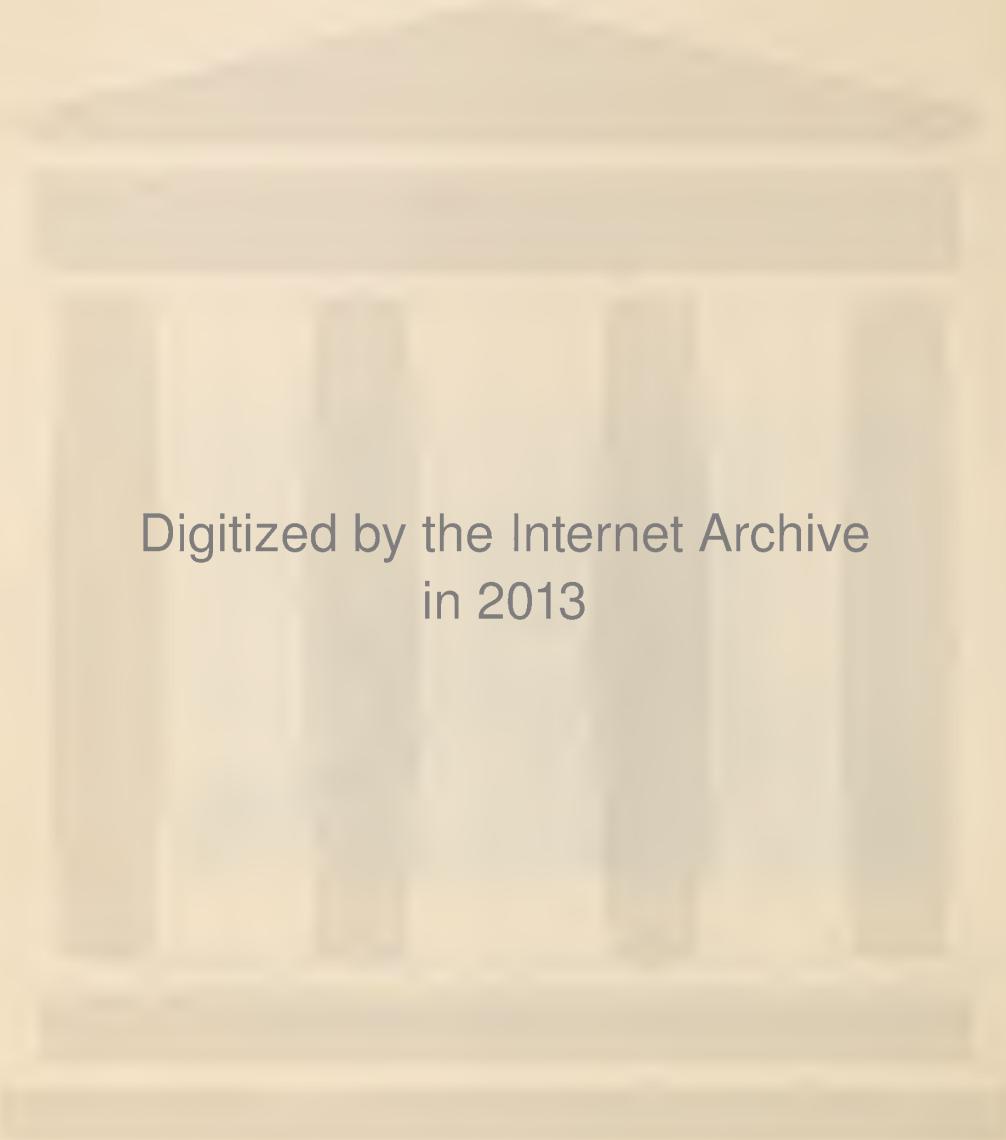


Figure 1.—Soil-washing apparatus, showing the two largest cans and the pulleys for turning the stirrer.



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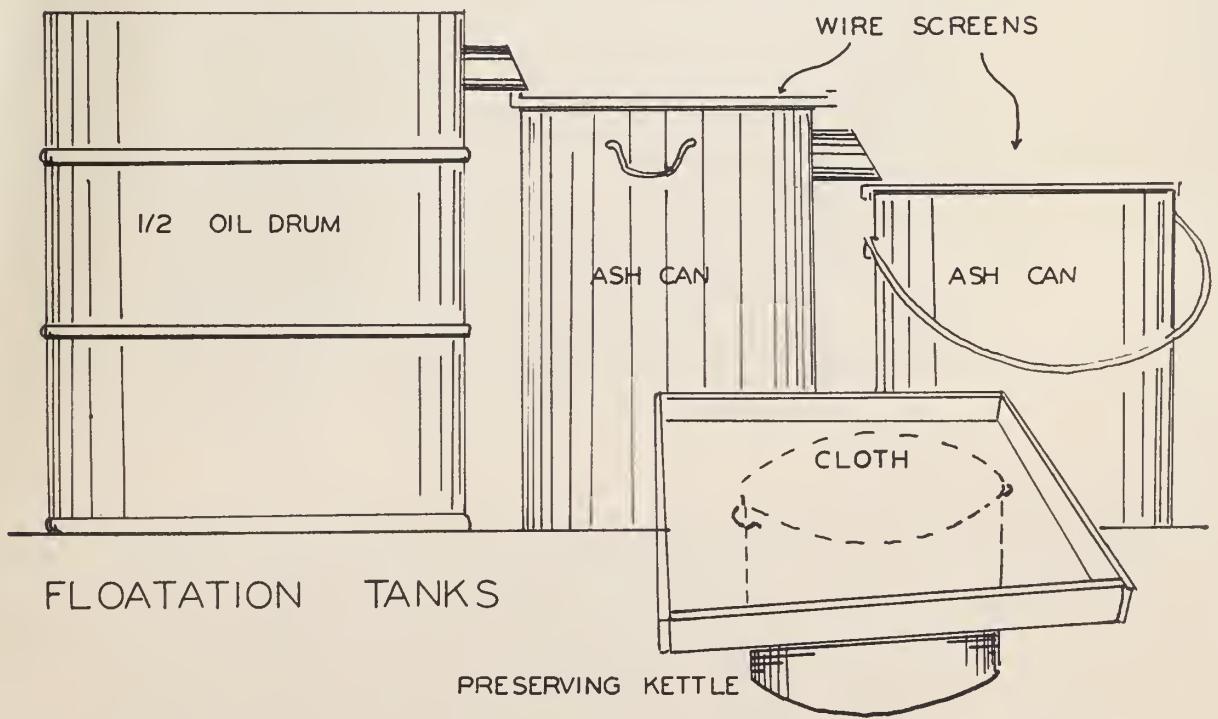
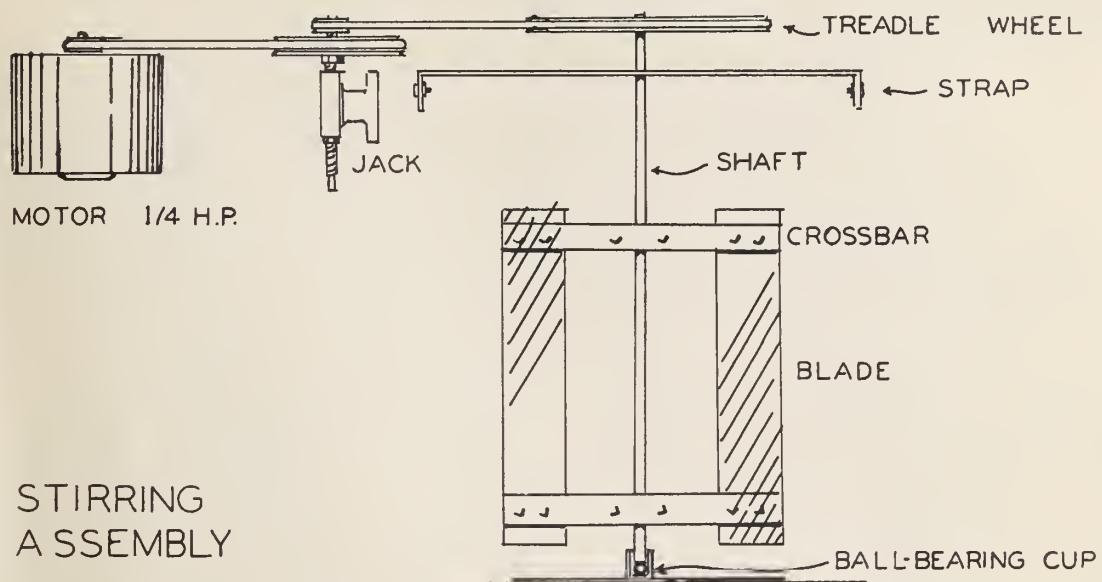


Figure 2.—Diagram of stirring apparatus and can assembly.

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